REMARKS

Claims 1-4, 6-14 and 16 are all the claims pending in the application. Applicants amend claims 6 and 16. Support for the amendment to claim 6 can be found, *inter alia*, in claim 6 as originally filed. Claim 16 has been amended only for clarity. No new matter is added. Entry is respectfully respected.

Claim Objection

The Examiner objected to claim 16, requesting correction of an informality.

Applicants amend claim 16 to recite "farther from" in accordance with the Examiner's request. There is no change in the scope of claim 16.

Entry is respectfully requested.

Rejections under 35 U.S.C. §112

Claim 6 was rejected under 35 U.S.C. §112, first paragraph. Specifically, claim 6 states that the variable "x1" can be larger than 0.1 and ≤ 0.2, which according to the Examiner, lacks written description support in the specification.

Claim 6 was separately rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, the Office Action asserts that the variable "x1" is defined therein as being as large as up to 0.2, which is said to be inconsistent with the limitation in claim 1, from which claim 6 depends, which requires "x1" to be no larger than 0.05.

In response, Applicants amend claim 6 to recite $Al_{x1}Ga_{1-x1}N(0<x1\leq 0.\underline{02})$. Support for the upper limit for the value of x1 as being .<u>02</u> can be found, *inter alia*, in claim 6 as originally filed.

Entry and withdrawal of the foregoing rejections under § 112 is respectfully requested.

The Claims Are Patentable Over Shibata et al

Claims 1-4, 6-14 and 16 stand rejected at page 3 of the Office Action under 35 U.S.C. § 103(a) as being unpatentable over Shibata et al (U.S. Publication No. 2002/0155682).

Shibata et al was cited as disclosing a Group-III nitride semiconductor element comprising a substrate (e.g., a sapphire single crystal) with a first nitride semiconductor layer (AlN) provided thereon (allegedly similar to what is included in layer 1 shown in Figures 1-3); a second nitride semiconductor layer composed of $Al_{X1}Ga_{1-X1}N$ (allegedly similar to layer 2 in Figures 1-3; such as: $Al_{0.1}Ga_{0.9}N$, with x1 = 0.1; island-shaped) provided on the first nitride semiconductor layer; and, a third nitride semiconductor layer composed of $Al_{x2}Ga_{1-x2}N$ (allegedly similar to layer 3A in Figures 2 and 3; such as: $Al_{0.95}Ga_{0.05}N$, with x2 = 0.95) provided on the second nitride semiconductor layer.

The Examiner assumes that the first nitride semiconductor layer (AlN) in Shibata is naturally a substantially single crystal, since it is epitaxially grown on the single crystal substrate at a temperature of 1200°C (citing paragraph [0066]), and/or because it is allegedly grown using the materials and process conditions that are substantially the same as those described in Applicants' specification (citing page 9, lines 16-22).

The Examiner concedes that Shibata et al does not expressly disclose that the thickness of the first nitride semiconductor layer (AlN) can be from 0.005 to 0.5 μm, and/or that the Al composition ratio for the variable "x1" regarding the second nitride semiconductor layer can be larger than 0 but no larger than 0.05. However, the Office Action takes the position that thickness and composition ratio are both art-recognized result-oriented parameters, subject to routine experimentation and optimization.

Hence, the reason for the rejection was that it would have been obvious to make the Group-III nitride semiconductor element of Shibata wherein the AIN layer thickness is within the range of 0.01 to 0.5 μm, and/or wherein the Al-composition ratio for the variable "x1" in the second nitride semiconductor layer is between 0.001 and 0.05, in order to optimize performance and/or process conditions related thereto.

Applicants respectfully traverse.

The Examiner is of the opinion that thickness and composition ratio are both art-recognized result-oriented parameters, subject to routine experimentation and optimization. Applicants respectfully disagree.

When the thickness of the first nitride semiconductor layer falls within the range of 0.005 to 0.5 μm, as specified in claim 1, the nitride semiconductor layers (including the second nitride semiconductor layer) grown atop the first nitride semiconductor layer exhibit excellent crystal morphology and improved crystallinity (see page 9, lines 10 to 15, of the specification).

The first nitride semiconductor layer serves as a buffer layer and thus it is generally considered preferable that the first nitride semiconductor is thick. Therefore, the thickness of the first nitride semiconductor layer described in claim 1 of the present invention cannot be obtained by routine experimentation.

In contrast, Shibata neither discloses or suggests a specific range for the thickness of the first nitride semiconductor layer. In Examples 1 and 2 of Shibata, the A1N film has a thickness of 1 μm as the first nitride semiconductor layer (see [0066] and [0069] of Shibata).

Further, in present claim 1, the first nitride semiconductor layer is composed of ALN; x1 in $Al_{x1}Ga_{1-x1}N$ crystals constituting the second nitride semiconductor layer falls within a range of

$0 \leq x1 \leq 0.05$; and x2 in $Al_{x2}Ga_{1-x2}N$ constituting the third nitride semiconductor layer falls within a range of $0<x2<1$; and xl and x2 satisfy the relationship $xl+0.02 \leq x2$.

When xl falls within the above-described range, the initial growth of AlGaN crystals constituting the third nitride semiconductor layer may be attained by means of the GaN growth mode, and the dislocation density of the third nitride semiconductor layer is reduced. However, when xl is greater than the above-described range, growth of the third nitride semiconductor layer is dominated by the AlGaN growth mode, and the dislocation density of the third nitride semiconductor layer is not reduced (see page 11, lines 15 to 28, of the specification). On the other hand, when the Al content of the second nitride semiconductor layer is lower than that of the third nitride semiconductor layer, the dislocation density of the third nitride semiconductor layer can be reduced (see page 13, lines 33 to 36, of the specification).

Notwithstanding the foregoing, Shibata merely discloses that island-shaped crystal portions are easily made by adjusting the compositions of the first and the second nitride, and thus the relation of $x1 \leq yl-0.1$ can be satisfied for the Al content x1 of the second nitride and the Al content yl of the first nitride (see [0046] and [0047] of Shibata). When the claimed relationship is satisfied, the Al content of the first nitride must be larger than that of the second nitride. However, as described in paragraph [0045] of Shibata, it is also desirable to have an Al content of the second nitride that is larger than the Al content of the first nitride. Thus, there is a contradiction in the disclosure of Shibata. Shibata nowhere discloses an upper limit for the Al content xl of the second nitride, nor a specific range for the Al content of the third nitride. For these reasons, Shibata fails to anticipate or render obvious the features claimed.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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